Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

0733674375

COMPUTER SCIENCE **0478/13**

Paper 1 Theory **May/June 2016**

1 hour 45 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

No calculators allowed.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
No marks will be awarded for using brand names of software packages or hardware.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The maximum number of marks is 75.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **13** printed pages and **3** blank pages.

© UCLES 2016

1 Some software can be described as free, freeware or shareware.

Tick (✓) the appropriate boxes in the table below to show which features apply to these three types of software.

Software feature	Free	Freeware	Shareware
Software source code can be freely accessed and modified as required			
All the features of the full version of the software are not made available; the full version needs to be purchased first			
The original software is subject to all copyright laws			
It is possible to distribute modified versions or copies of the software to friends and family			

[3]

2 Hexadecimal codes are used in MAC addresses.

(a) State what is meant by the term MAC.

.....[1]

(b) Explain what the hexadecimal code in a MAC address represents.

.....

.....

.....

.....

.....

.....[3]

3 **(a)** Five sensors and five applications are shown below.

Draw a line to link each sensor to its most appropriate application.

Sensor	Application
Light sensor	Monitor the pollution levels in a river
Moisture sensor	Control the switching off and on of street lights
Gas sensor	Detect intruders breaking into a building
pH sensor	Monitor the amount of water left in clothes in a dryer
Pressure sensor	Monitor acidity levels in the soil in a greenhouse

[4]

(b) Automatic doors in a building are controlled by the use of infrared sensors and a microprocessor.

Describe how the sensors and the microprocessor are used to automatically open a door as a person approaches.

.....

.....

.....

.....

.....

.....

.....

.....[4]

4 **(a)** Nikita wishes to print out some documents and connects her printer to the computer using one of the USB ports.

(i) Identify what type of data transmission is being used.

.....[1]

(ii) Give **three** reasons for using a USB port.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(iii) The printer runs out of paper while it is printing the documents. A signal is sent to the processor to request that the problem is dealt with.

Name this type of signal.

.....[1]

(b) State **one** suitable application for **each** printer below. A different application must be given for each printer.

Inkjet printer .....

.....

3D printer .....

.....

[2]

(c) Name another type of printer and describe **one** way in which it is different from the printers named in **part (b)**.

Give an application for this printer.

Type of printer .....

Description .....

.....

.....

Application .....

.....

[3]

5 A computer-controlled machine produces plastic sheets. The thickness of each sheet must be within a certain tolerance. The sheets are kept below 50 °C as they move over rollers at 10 metres per second.

Three parameters need to be monitored all the time.

Parameter	Description	Binary value	Conditions
D	sheet thickness	1	thickness of sheet in tolerance
		0	thickness of sheet out of tolerance
S	roller speed	1	roller speed = 10 metres/second
		0	roller speed <> 10 metres/second
T	temperature	1	temperature < 50 °C
		0	temperature >= 50 °C

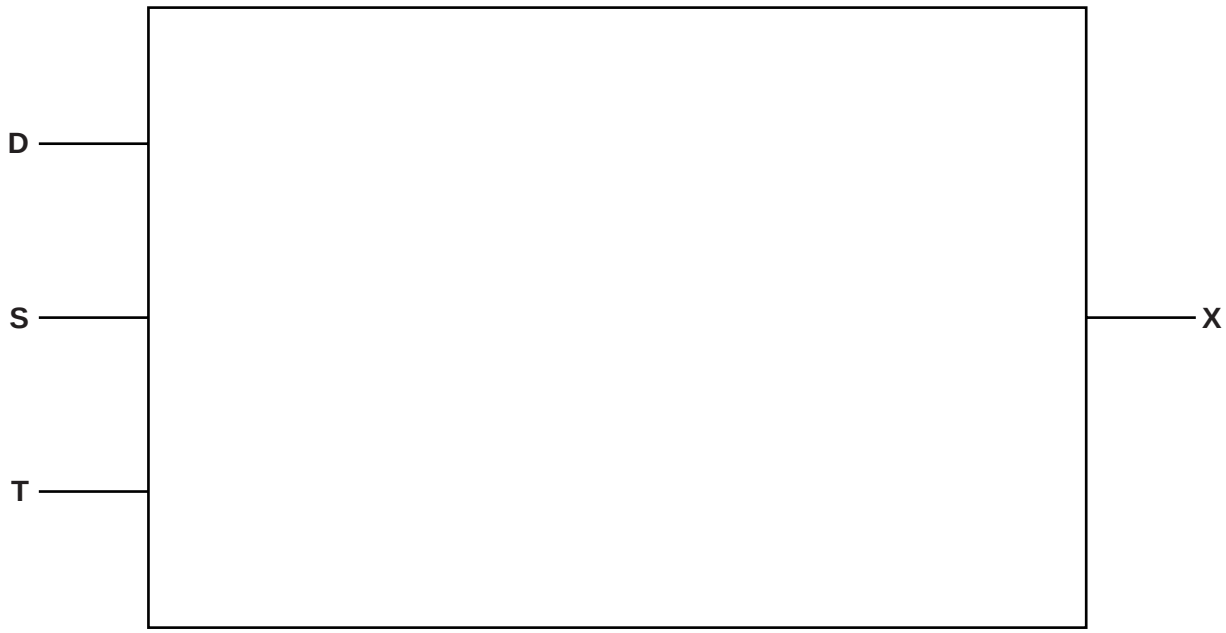
An alarm, **X**, will sound if:

thickness is in tolerance AND (roller speed <> 10 metres/second OR temperature >= 50 °C)

OR

roller speed = 10 metres/second AND temperature >= 50 °C

(a) Draw a logic circuit to represent the above monitoring system.



[6]

(b) Complete the truth table for the monitoring system.

D	S	T	Working Space	X
0	**0**	**0**		
0	**0**	**1**		
0	**1**	**0**		
0	**1**	**1**		
1	**0**	**0**		
1	**0**	**1**		
1	**1**	**0**		
1	**1**	**1**		

[4]

6 Secure socket layer (SSL) is used in the security of information on Internet websites.

(a) State how it is possible for a user to know that a website is secure by looking at the web address.

.....

.....[1]

(b) Describe **three** of the stages a web browser goes through to detect whether a website is secure.

1 .....

.....

.....

2 .....

.....

.....

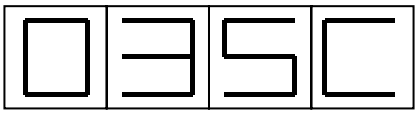
3 .....

.....

.....

[3]

7 Each seat on a flight is uniquely identified on an LCD above the seat. For example, seat 035C is shown as:



The first three characters are digits that represent the row.
The fourth character is the seat position in that row. This is a single letter, A to F, that is stored as a hexadecimal value.

Each of the four display characters can be stored in a 4-bit register. For example, 0 and C would be represented as:

	8	4	2	1
0:	**0**	**0**	**0**	**0**
C:	**1**	**1**	**0**	**0**

(a) Show how the 4-bit registers would store the remaining two characters, 3 and 5.

3				
5				

[2]

(b) Identify which seat is stored in the following 4-bit registers.

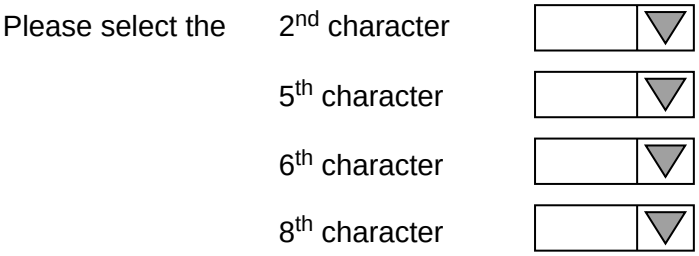
0	**0**	**0**	**1**	→ .....
1	**0**	**0**	**1**	→ .....
0	**1**	**0**	**0**	→ .....
1	**1**	**1**	**0**	→ .....

[2]

© UCLES 2016

8 A bank offers an online service to its customers. The bank has developed a "*SafeToUse*" system that asks each customer to enter four randomly chosen characters from their password each time they log in.

The customer selects these four characters from drop-down boxes. For example:



(a) (i) Explain why it is more secure to use drop-down boxes rather than entering characters using a keyboard.

.....

.....

.....

.....[2]

(ii) Give a reason why the system asks for four characters chosen at random.

.....

.....[1]

(b) Biometrics is an additional form of security.

Give **two** examples of biometrics.

1 .....

2 .....

[2]

9 Check digits are used to ensure the accuracy of entered data.

A 7-digit number has an extra digit on the right, called the check digit.

digit position:	1	2	3	4	5	6	7	8
digit:	–	–	–	–	–	–	–	–

check digit

The check digit is calculated as follows:

- each digit in the number is multiplied by its digit position
- the seven results are then added together
- this total is divided by 11
- the remainder gives the check digit (if the remainder = 10, the check digit is X)

(a) Calculate the check digit for the following number. Show all your working.

4 2 4 1 5 0 8 …

.....

.....

.....

Check digit .....

[2]

(b) An operator has just keyed in the following number:

3 2 4 0 0 4 5 X

Circle below **correct** if the check digit is correct **OR incorrect** if the check digit is incorrect.

correct **incorrect**

Explain your answer.

.....

.....

.....

.....

[3]

10 **Six** security issues and **six** descriptions are shown below.

Draw a line to link each security issue to its correct description.

Security issue	Description
Pharming	illegal access to a computer system without the owner's consent or knowledge
Phishing	software that gathers information by monitoring key presses on a user's keyboard; the data is sent back to the originator of the software
Viruses	malicious code installed on the hard drive of a user's computer or on a web server; this code will re-direct the user to a fake website without the user's knowledge
Hacking	creator of code sends out a legitimate-looking email in the hope of gathering personal and financial information from the recipient; it requires the user to click on the link in the email or attachment
Spyware	a message given to a web browser by a web server; it is stored in a text file; the message is then sent back to the server each time the browser requests a page from the server
Cookies	program or code that replicates itself; designed to amend, delete or copy data or files on a user's computer; often causes the computer to crash or run slowly

[5]

© UCLES 2016

11 **(a)** Four examples of optical storage media are:

- DVD-RW
- DVD-RAM
- CD-ROM
- Blu-ray disc

The table below shows four features of optical storage media.

Tick (✓) the appropriate boxes in the table to indicate which of the features apply to each example of optical storage media.

	Single track	**Many concentric tracks**	**Blue laser used to read/ write data**	**Red laser used to read/ write data**
DVD-RW				
DVD-RAM				
CD-ROM				
Blu-ray disc				

[4]

(b) Solid state drives (SSD) are replacing hard disc drives (HDD) in some computers.

(i) Give **three** reasons why this is happening.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(ii) Explain why many web servers still use hard disc drive (HDD) technology.

.....

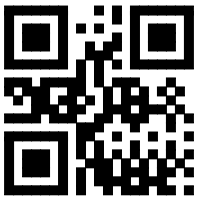
.....

.....

.....

.....[2]

12 **(a)** Name the following type of barcode:



.....[1]

(b) The barcode in **part (a)** contains the denary value 2 6 4 0

Convert this value to hexadecimal.

.....

.....

Write the value as a 12-bit binary number.

[4]

(c) An airport uses the type of barcode shown in **part (a)** to advertise local places of interest.

Describe how a visitor landing at the airport could use these barcodes to help plan their visit.

.....

.....

.....

.....

.....

.....

.....[3]

BLANK PAGE

© UCLES 2016

BLANK PAGE

© UCLES 2016

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.